

ORGANIZATIONAL MEASURES IN FUNCTION OF INTERMODAL TERMINAL CAPACITY ENHANCEMENT *

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Abstract. *With intensive implementation of the intermodal transport techniques and the tendency of constant growing of the intermodal transport share, since the 80s of the past century till today, the capacity needs of the intermodal terminal have also been growing. The terminal capacity can be increased not only by investing in its infrastructure, but also through implementation of certain organizational measures. In this respect, it is necessary to prepare a preview of these measures, also known as “the best EU practice”, already shown to be successful, and to adapt them to the market of our region, which is yet to develop in this direction.*

Key Words: *Intermodal Terminal, Capacity Management, Organizational Measures*

1. INTRODUCTION

Operators of intermodal terminals from Europe, which are primarily designed for accommodation of a certain number of intermodal transport units (hereinafter: ITU), very often find themselves in a situation when there is saturation of terminal physical capacity. At that moment any subsystem inside the terminal, as well as the applied operational technology, cannot meet the requirements of intermodal transport operators (hereinafter: ITO), customers, as well as those of the railway undertakings (hereinafter: RU) and road transport carriers.

When it is impossible to enlarge terminal infrastructure, terminal operators (hereinafter: TO) are in situation to look for pragmatic solutions in order to eliminate the obstacles on a short-time basis and continue with their regular operations. This approach is often better than introduction of fundamental changes that would drastically affect the whole system.

On the other hand, many TOs holding the leading positions in Europe have developed mechanisms for process optimization and efficient terminal capacity management that can

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be classified within the scope of "the best EU practice", and as such represent guide models to be followed during the design of modern intermodal terminal in Serbia and its integration into the intermodal transport market in Europe.

2. TERMINAL CAPACITY BASIC DETERMINANTS

Terminals are the basic components of an integrated intermodal transport network and as such they should be able to respond to the requirements in terms of capacity, in order to ensure transshipment between road-railway in an efficient and safe way.

Transshipment capacity of the terminal is determined by several basic factors:

1. terminal position in the rail and road network;
2. terminal size and organization;
3. length of handling tracks; and,
4. type and number of the (mobile or fixed) handling equipment.

With more intensive implementation of intermodal transport techniques, followed by a tendency of constant growth of intermodal transport shares, from the 80-ies of the past century to the present time, the characteristic modular type of terminal layout has been developed, and usually applied as such during the terminal design.

Transshipment terminal capacity can be increased in two ways:

1. by physical enlargement of terminal infrastructure (increasing the number and length of handling tracks; expansion of interim storage space or by switching to more efficient handling mechanization); or,
2. by implementation of organizational measures, which are primarily related to the optimization of technological processes.

Since the economic situation and still on-going crisis greatly affecting the transport sector, the optimization of technological processes with implementation of organizational measures will get more and more importance.

3. INTERMODAL MARKET IN SERBIA AND REGION

The project of Pan-European transport corridors, defined in 1994 in Crete, and later amended in Helsinki in 1997, is of great importance for Southeast European countries. From ten corridors in total, six of them passes through the region of Southeast Europe and this fact valorises the transport position of Serbia as a transit country. The ultimate goal of establishing such a network is functional interregional integration with simplified and accelerated traffic flows, which imply border opening and optimization of the transport process.

One of the basic principles of arrangement within the defined corridors is intermodality, which provides a choice between integrated and interrelated forms of transport. Basically, the defined corridors are being further developed through the concept of TINA (Transport Infrastructure Needs Assessment) transport network which belongs to the specific corridors and represents a continuation of already established functional Trans-European Transport Network- TEN-T on the territory of the European Union.

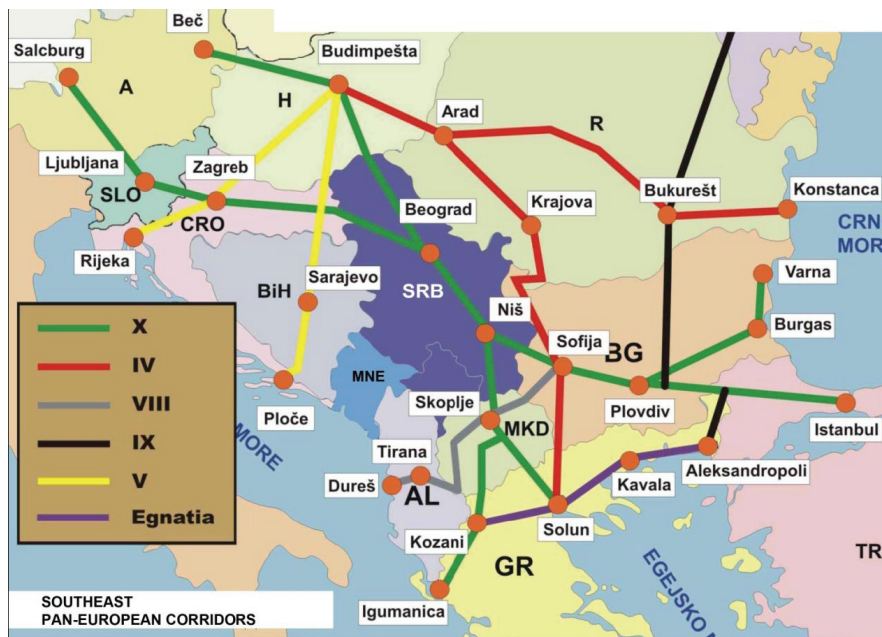


Fig. 1 Distribution of Pan-European corridors

Focussing on Serbian intermodal transport market, the very first impression would be that intermodal transport is very poorly developed and is primarily related and identified as continental transport of containers in import, i.e. with their further distribution in hinterland of the ports.

Judging by available information, the general conclusion of stakeholders is that the needs and the current state of affairs of the Serbian economy correspond to the volume of around 50,000 TEU per annum. In that structure 40" containers are predominate (with a share of about 70%), while the ratio of containers in import and export is 80%:20%. Due to this disparity in the exchange of goods, the containers are in most cases returning empty to port in order to avoid container demurrage charges.

Dominant directions are ports of the Adriatic Sea, first of all the Port of Rijeka with a share of about 70% of the total flow. The port of Bar currently serves the Serbian market with about 20% of the container flows while the remaining 10% goes through the ports of Koper, Constantza and Thessaloniki. The intermodal transport stakeholders have a general consensus that this trend will dramatically change with joining of Croatia to EU (in mid-2013.), which will result in a significant redirecting of flows that gravitate to the countries outside the EU to the port of Bar.

There is also some potential for transport of swap bodies in order to connect intermodal market of Serbia with markets in Germany, Austria and Italy (import of industrial products and equipment), Romania, Poland, Hungary and the Czech Republic (import of consumer goods) and Russia (export of agricultural products).

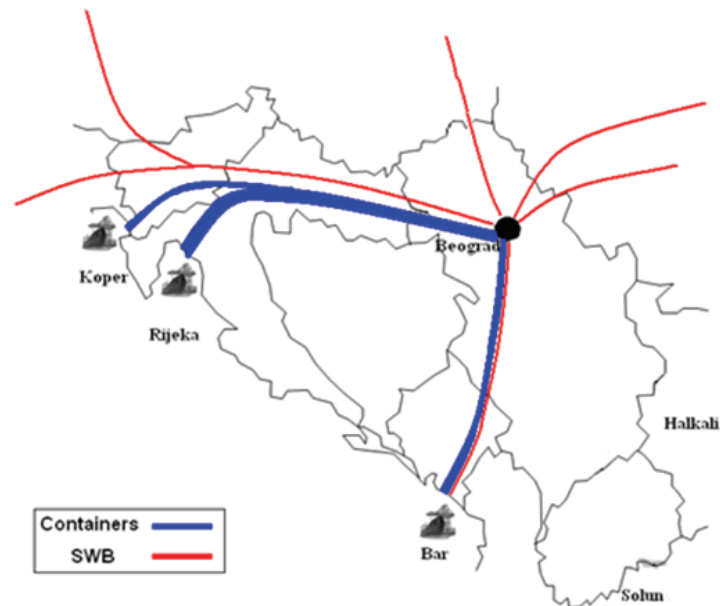


Fig. 2 Potential of Serbian intermodal flows

Presence of other intermodal transport techniques (except road - railway transport of containers) in total intermodal flows is negligible, primarily due to the lack of modern terminals equipped for transshipment of these ITUs. Besides the terminal that operates within the JSC Serbian Railways, located in the very centre of Belgrade, there are two small private terminals with one of them serving the Port of Rijeka as a dry port concept.

Attractiveness of Serbia on the international intermodal transport market will be substantially changed with the construction of modern intermodal terminal in Batajnica (suburbs of Belgrade).

4. THE CHARACTERISTICS OF THE FUTURE TERMINAL

As mentioned above, the so-called modular type of terminal is composed of several functional units. Manipulative area is the most important entity and in the case of Belgrade Intermodal Terminal (hereinafter: BIT) will consist of:

- 2 transshipment tracks for loading/unloading of ITUs and 1 bypass track for shunting locomotive rides;
- 4 truck lanes: 2 bypass lanes, 1 loading/unloading and 1 emergency lane; and,
- interim storage space: 3 rows for temporary storage of ITUs (containers, frigo-containers, swap bodies and containers with dangerous goods).

Planned layout of the future BIT terminal, which is designed according to the principles and guidelines of "the best EU practice"- provided by DB International experts with world-wide experience in this field, is shown in the following figure.

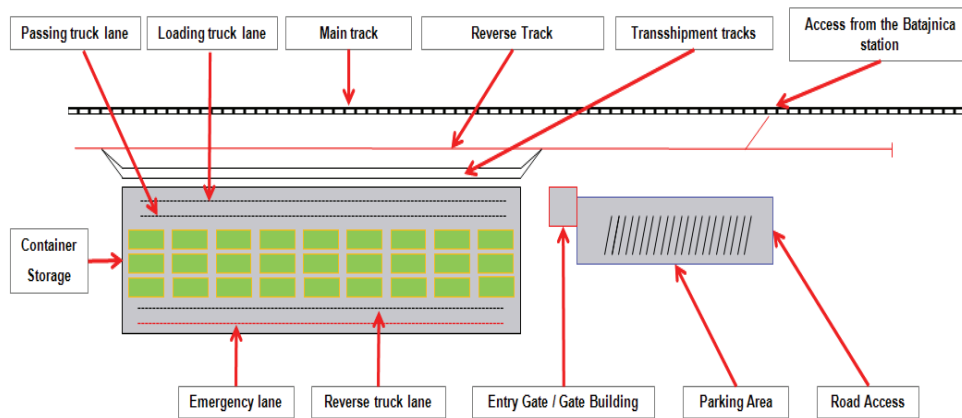


Fig. 3 BIT layout

Step-wise development of Belgrade Intermodal Terminal would ensure economic and financial sustainability of investment and ensure planned iterative capacity expansion fully in accordance with the growing demands coming directly from the market and potential clients.

5. PREVIEW OF THE ORGANIZATIONAL MEASURES

Bearing in mind that there is no modern intermodal terminal of this type in Serbia and region - a question arises: *which organizational measures should be implemented after terminal construction in order to ensure adequately managing of its capacity and positive influence on increase of ITU flows?* Organizational measures, implemented by TO, would also represent a form of incentive for development of intermodal transport in general.

There exists a whole set of measures derived from the practice of successful and well operating intermodal terminals in EU. Yet, only a certain number of them could be applicable to the market conditions currently existing in Serbia and region.

Implementation of these measures should be aimed at positioning of an intermodal transport as a fully competitive to the traditional one and today in a vast majority used road transport.

Among the measures, which could be seen as the *best EU practice*, but still applicable to the Serbian market, the following could be distinguished:

5.1. Shunting services controlled by TO

The RU engaged by ITO with the main rail haul is also usually used for inside terminal manoeuvring rides, as well as for carriage of wagons taken out or wagons to be included in the composition (small shunting rides).

In order to ensure efficiency of these operations it is necessary to establish good and smooth coordination, which seems to be hardly possible in the present working environment. Practice of successful European terminals shows that shunting operations are managed by TOs, totally independent or in cooperation with RUs. Positive effects of this approach are:

1. operational processes facilitation and reduction of losses between involved stakeholders;
2. TOs are enabled to reduce train delays;
3. rising of operational flexibility; and,
4. higher prioritisation level of operations.

This measure ensures not only terminal capacity and efficiency enhancement, but also brings a benefit to RUs since it does not need to provide for its own equipment and personnel in every terminal.

5.2. Bonus/malus pricing system

Interim storage capacity management in a proper way, as the most vital entity, is essential for smooth functioning of the whole terminal. Inland port terminals (usually operating as *dry-ports*) are generating a considerable share of their revenues from storage of containers. On the other hand, rail-road terminals are facing the problem when ITUs are staying placed inside terminal interim storage for more than 24 hours. This is particularly owing to the fact that these terminals were originally designed for direct rail-road transshipment - in practice only 10-15% of transshipping operations are done directly.

Bonus-malus pricing system, as an incentive at the same time, represents a measure for interim storage capacity management which foresees a reward ("*bonus*") for a customer who picks up his shipment early - for example in the first three hours after the time of availability of the train. Customers picking up their shipments after 24 hours are being extra charged through a penalty ("*malus*"). The TO is invoicing interim storage services to his clients on a monthly basis and their costs can significantly vary depending on number of "*bonuses*" or "*maluses*" they have collected in a previous month.

Estimations are that this measure ensures a total terminal capacity increase effect of about 5%.

5.3. Increase of the flow factor

If the inside terminal track capacity, on a daily average, is occupied by only 1 train (inbound or outbound) then this terminal applies a static capacity management concept. In this respect it is necessary to introduce a term of so-called "*flow factor*" which has a value of 1.0 when each usable meter of a handling track is used by a train being processed. Following the same approach, a flow factor of 2.0 means that every meter of the handling track is being used by 2 different trains (inbound or outbound) on average daily basis.

It is obvious that the introduction of such a dynamic operational concept is one of the most effective measures to enhance the capacity of a given terminal infrastructure. Increasing this flow factor from 1.0 to 2.0 implies theoretically a chance for doubling of the transshipment capacity.

With implementation of this measure means that the transshipment tracks usage is doubled on a daily basis since the train sets or *shuttle* trains are being hauled on tracks dedicated for parking (manoeuvring rides).

The implementation costs for this measure are primarily related to incensement in cost of manoeuvring services that will drastically participate in the final price which TO invoices to the clients.

5.4. „First/Last mile“ trucking services

Similar reasons as for shunting operations have led some of TOs to offer, as part of their service package, ITUs pick up/delivery service on relation intermodal terminal-client (and vice versa). This type of service completely fits into one of the very basic principles of intermodal transportation - "door to door" transportation service.

With provision of adequate and sustainable services of this type, a *win-win* business relationship can be created bringing a direct benefit to all involved stakeholders.

Although the direct impact on the total terminal's transshipment capacity may be marginal, the trucking services can also be used to increase a capacity of interim storage space and to facilitate accessibility to the usually crowded terminal's handling area.

5.5. Extension of terminal opening time

Opening time of intermodal terminals differs from site to site, but it could be said that some typical schedules have evolved in Europe over the years. Only a very few intermodal facilities are working on a single-shift-basis and are open for 8 - 10 hours. Most of them apply a two-shift scheme with 12-16 opening hours in total, from Monday to Friday. Considering a 24-hours economy these terminals are on average open to customers with 53% of the maximum available time.

Extension of terminal opening time can be done in two ways:

- with enlargement of opening hours for operating part of terminal (rail-side); and,
- with extension of the opening time also for road-side part for pick-up/delivery of ITUs.

Extending the terminal opening time could mean increasing the daily opening period (up to 24 hours) or that terminal will be opened also on Saturdays or even Sundays.

Implementation of extension of customer-related opening times could bring about an increase of transshipment capacity of at least 10 - 20 % compared to the initial situation.

5.6. Sustainable and punctual railway timetable

Terminals that are already congested with ITUs or operating at their capacity limits have a very few or no further *buffer* time to compensate for delayed trains. Only in the case that trains are running at a high rate of punctuality, and timetable is due to this sustainable, the terminal can operate smoothly - both in terms of its capacity and customer relationships. On the contrary, unreliability of a timetable can have a significant negative effect on the terminal technical capacity.

Experience of TOs all over Europe leads to the conclusion that lot of joint efforts have to be invested in order to induce a change of behaviour of RUs. As an instrument for that they foresee *bonus-malus incentives* and *priority rules* - "*punctual trains are served first*" - priority is given to the trains running to according Timetable on force. "*Time windows*" for train arrivals are defined in accordance with the length of train routes, in order to absorb small delays and avoid a greater negative impact on the terminal operation.

Successful implement of this concept needs interaction and close cooperation between TO, RU and ITO. Today this can be seen only in a very few terminals in Europe. But still, this represents the basic starting point that should be built upon in the future in order to achieve full interaction of all stakeholders in intermodal transport chain. Implementation of this measure could bring up to 20% of terminal capacity enhancement.

6. CONCLUDING REMARKS ON THE EXAMPLE OF BIT

The focus of the region towards EU accession and integration in European transport flows and trends, provides for a significant opportunity to enhance intermodal or combined rail-road transport in our region as well. It should be primarily seen as response to demands of the economy in the region, in terms of positioning of their products to various markets (especially in the EU market), then in response to the issues of competitiveness of our carriers and, ultimately, as the answer to the ever-present and actual problems related to environmental aspect of transportation.

Design, construction and management of modern intermodal terminal in Serbia can be completely seen as "ground-breaking" or "pioneer" project, so guidelines and examples of the "the best EU practice", followed by experience and expertise of international experts in this field, are more than welcome.

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ORGANIZACIONE MERE U FUNKCIJI POVEĆANJA KAPACITETA INTERMODALNOG TERMINALA

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Sa intenzivnijom implementacijom intermodalnih transportnih tehnika i tendencijom konstantnog rasta udela intermodalnog transporta od 80-tih godina prošlog veka pa do danas, rasle su potrebe za kapacitetima intermodalnih terminala. Na kapacitete terminala se može uticati ne samo investiranjem u infrastrukturu, već i primenom određenih organizacionih mera. Potrebno je napraviti pregled tih mera, poznatih i kao „najbolja praksa Evrope“, koje se već pokazuju kao uspešne i prilagoditi ih tržištu našeg regiona, koje će se tek razvijati u ovom pravcu.

Ključne reči: *intermodalni terminal, upravljanje kapacitetom, organizacione mere*